EVALUATION of the CNA RECOMMENDED COSAL MODEL

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Report 144

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REPORT 144

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ABSTRACT

This study evaluates the recommended changes to current shipboard allowance policy resulting from a recent CNA (Center for Naval Analyses) study. The objective is to determine the impact of these changes on peacetime Fleet support. Historical CASREP (Casualty Reporting System) data were used to identify equipments essential to primary missions. The current COSAL (Coordinated Shipboard Allowance List) Model was modified to stock a greater range of items supporting these equipments. The impact was then measured in terms of range of items stocked, investment, effectiveness, and reductions in CASREP requisitions.

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EXECUTIVE SUMMARY

1. Background. Current Navy policy for shipboard allowances is specified in OPNAVINST 4441.12A. Numerous proposals in recent years for changes to this policy indicated the need for a comprehensive review and possible changes in future policy. Accordingly, CNO (Chief of Naval Operations) directed CNA (Center for Naval Analyses) to conduct a shipboard parts allowance policy study. As a result of the study, CNA recommended modification of the current insurance item stockage threshold for items supporting primary mission requirements. CNO approved the recommendation and enumerated tasks required for implementation. One such task was to simulate the effects of the proposed modification.

2. Objective. The objective of this study is to determine the impact on peacetime Fleet support of CNA recommended modifications to the FLSIP (Fleet Logistics Support Improvement Program) COSAL (Coordinated Shipboard Allowance List) Model.

3. Approach. Using historical CASREP (Casualty Reporting System) data, an EIC (Equipment Identification Code) level essentiality was developed for each of four classes of ships to classify equipments as essential to either a primary mission or a secondary mission. The basis of this essentiality coding was the proportion of C3 and C4 severity CASREPs to total CASREPs for an EIC. The allowance candidate items for each of four test ships (one from each ship class) were then coded with the essentiality of the EICs to which they were applicable. Items having application to more than one EIC with both primary and secondary essentialities were designated as primary. The insurance item stockage routines of the current FLSIP COSAL Model were modified in accordance with the CNA recommendations. The impact of modified FLSIP relative to the current model

was determined. Measurement of the impact was made in terms of range of items, investment, range and requisition effectiveness, and reduction in CASREP requisitions. Actual demand data were used in measuring effectiveness.

4. Findings. For the four test ships considered in this study, about one-ninth of the equipments (EICs) and two-fifths of the ships' allowance candidate items were coded essential to a primary mission. The recommended modifications to FLSIP resulted in average increases in SRI (Storeroom Items) range and investment of about 20% and 40%, respectively, across the four ships. However, significant increases in model effectiveness and the proportion of CASREP requisitions that were for stocked items were also realized, particularly for items vital to primary mission equipments. For these items, model range and requisition effectiveness improved by up to 15 and 11 percentage points, respectively. The proportion of CASREP requisitions that were for stocked items improved up to 12 percentage points for all CASREPs and up to 21 percentage points for C3/C4 CASREPs. In spite of these improvements, deficiencies in the COSAL candidate files precluded attainment of the current 65% gross effectiveness goal or the proposed mean supply response time goal of 120 hours.

I. INTRODUCTION

The task of supporting the number and types of ships in the Fleet, each configured with different equipments and operating from various support bases worldwide, is a complex and difficult one. A vital part of the logistics support system is the process of determining spare and repair parts to be stocked aboard ship. Current Navy policy for determining shipboard allowances is specified in OPNAVINST 4441.12A. In recent years a number of independent efforts aimed at developing alternative models for determining shipboard allowances have resulted in recommendations for changes to or deviations from current policy. Fleet readiness statistics provide support for these efforts to improve material availability aboard ship. There has been, however, no consistent indication as to whether the deficiency in availability might best be corrected by changes to allowance policy, parts funding levels, training, personnel, maintenance policy, system complexity, configuration management, or combinations thereof. The complexity of the variables that impact on allowance policy suggested the need for a review of the current and alternative allowance policies and associated stocking models.

In light of the above, CNO (Chief of Naval Operations) issued a study directive by reference 1 of Appendix A for a shipboard parts allowance policy study. The study was to be conducted by CNA (Center for Naval Analyses). The objectives of the study were to: (1) identify a readily measurable definition of operational availability; (2) appraise the current and alternative shipboard allowance policies within the context of expected impact upon operational availability, secondary item support costs, feasibility of execution, and understandability of the policy and its associated stocking model; and (3) recommend what modification, if any, should be made to current

allowance policy. An advisory committee chaired by CNO (OP-41) was established to provide guidance for the study and to review and evaluate the progress of the study.

During reference 2 of Appendix A, the results and recommendations of the CNA study were presented to the advisory committee. The most significant of the CNA recommendations was to modify the FLSIP (Fleet Logistics Support Improvement Program) COSAL (Coordinated Shipboard Allowance List) Model. Under the CNA proposal those items supporting equipments essential to a primary mission of the ship would be identified and the insurance item stockage threshold for these items would be lowered to .10 or one unit demanded in 10 years. It is currently .25 or one unit demanded in four years. In addition, it was proposed that the depth for the higher demand (at least two but less than four units per year) insurance items be increased from one to two units.

During reference 3 of Appendix A, the CNA recommendations for modifying the FLSIP COSAL Model were approved. Via enclosure (2) to reference 4 of Appendix A, CNO enumerated the specific tasks required to implement the CNA recommendations for modified FLSIP. Included in the tasks were preparation of a POM (Program Objective Memorandum)-83 issue paper to provide funding for the revised stock levels and simulation of the effects of the modification utilizing historical 3M (Navy Maintenance and Material Management System) and CASREP (Casualty Reporting System) data. By reference 5 of Appendix A, COMNAVSUPSYSCOM (Naval Supply Systems Command) requested FLEMATSUPPO (Navy Fleet Material Support Office) to conduct a two-phased study to evaluate the CNA recommended modification. The first phase of the study involved the development of budget estimates for the modified FLSIP using selected classes of ships. These

budget estimates were provided to COMNAVSUPSYSCOM by reference 6 of Appendix A and served as the basis for the preparation of the POM-83 issue paper.

The second phase of the study involved determination of the impact on peacetime Fleet support of the modified FLSIP. The required essentiality coding was based on historical CASREP data. Impact statements were made in terms of range and investment increases and the potential for reductions in CASREPs and increases in supply effectiveness. Detailed descriptions of the approach used in conducting the study and the findings of the study are provided in the following sections of this report.

II. TECHNICAL APPROACH

Four ships, the CG 22 (USS ENGLAND), CG 30 (USS HORNE), DD 963 (USS SPRUANCE), and the DDG 23 (USS RICHARD E. BYRD), were designated by COMNAVSUPSYSCOM as the test ships for this study. The selection of these ships was based on the fact that each one of them had at least one system, as indicated below, which has had a history of problems in the Fleet.

Test Ship	Problem Systems
CG 22	AN/SPS-48, AN/SPG-55B
CG 30	AN/SPS-48, AN/SPG-55B
DD 963	AN/SPS-40, MK 86
DDG 23	AN/SPS-40

The required essentiality coding followed the technique approved by CHNAVMAT (Chief of Naval Material) in reference 7 of Appendix A. A description of the processing involved in determining essentiality is provided in Section IIA. A modified FLSIP COSAL was built for each of the four test ships utilizing the newly assigned essentiality codes and was evaluated relative to the current FLSIP COSAL. The evaluation measures are described in Section IIB.

A. ESSENTIALITY CODING. The CHNAVMAT approved technique for essentiality coding entails the identification, based on historical CASREP data for an entire class of ships, of those equipments which are essential to a primary mission of the ship. With the exception of the DD 963 class, a seven year history of CASREP data was obtained from SPCC's (Navy Ships Parts Control Center's) CASREP Master Data Bank for each of the classes of ships represented by the test ships discussed earlier. This history contained records of all CASREPs from all causes, including those not requiring any parts, submitted by ships of these classes over the period January 1971 through December 1977. Because the DD 963 class was relatively new, data for an additional year, 1978, was also obtained for this class.

These CASREP data were processed through a program designed to consolidate the data by EIC (Equipment Identification Code) within ship class and then assign the equipment level essentiality. The first step of the processing involved the summarization, by severity and within EIC and ship class, of the individual CASREPs. The number of C3 and C4 severity CASREPs for the EIC were then compared to the number of C2 CASREPs. If the ratio of C3 and C4 CASREPs to C2 CASREPs was at least one to five, the EIC was coded as essential to a primary mission of the ship. If the ratio was less than one to five, the EIC was coded as essential to a secondary mission of the ship. The EIC level essentiality assignments developed in this manner were reviewed by NAVSSESDETMECH (Naval Ship Systems Engineering Station Detachment Mechanicsburg) for possible consolidation of the summary CASREP data for different EICs which represent basically the same equipment. Where appropriate, the essentiality for the EIC was changed to reflect the new C3 and C4 to C2 ratio.

The next step in the essentiality coding process involved the coding at the component or APL (Allowance Parts List) level. A file containing the APLs applicable to each of the four test ships along with the EICs to which the APLs were identified was obtained from SPCC. EIC data voids in this file were reviewed by NAVSSESDETMECH and filled where possible. Using the EIC level essentiality assignments, each APL identified to a given EIC was assigned the same essentiality as the EIC. In those instances where an APL was identified to more than one EIC with both primary and secondary codes, the primary code was assigned to the APL. If the EIC for the APL was not on the EIC level essentiality file (i.e., there were no CASREPs for that EIC), the APL was assigned the secondary code.

The final step in the essentiality coding process was the assignment of codes at the item or NIIN (National Item Identification Number) level. Using the APL level essentialities, each item applicable to a given APL was assigned the same essentiality as the APL. When an item had applicability to more than one APL with both primary and secondary codes, the primary code was assigned to the item.

B. MEASURING IMPACT. As discussed earlier, four ships, the CG 22, CG 30, DD 963, and DDG 23, were chosen as test ships for evaluating the impact of modified FLSIP. Allowance candidate files for each of these ships were obtained from SPCC's Weapons Systems File. The candidate files represented the ships' configurations as of August 1980. The effectiveness measurements made in this study were based on historical shipboard usage data obtained from the 3M system. Ten quarters of usage data for the period January 1978 through June 1980 were obtained for each of the four test ships. To measure the impact of modified FLSIP on CASREPs, a three year history of CASREP parts requisition data for the period January 1978 through December 1980 was

obtained from the CASREP Master Data Bank for each test ship and for the entire class for each of the problem systems.

The current UICP (Uniform Inventory Control Program) FLSIP COSAL program was modified to reflect the CNA recommended changes to the insurance item routine. Using this revised program and allowance candidate files which had been coded with the CASREP-based essentialities, modified FLSIP COSALs were built for each test ship. COSALs based on the current FLSIP criteria were provided by SPCC. Planned maintenance and safety override requirements were considered for both COSALs. However, mission override requirements were not considered for either COSAL.

An analytic program was developed to measure the performance of each model in terms of range, dollar value, range effectiveness, requisition effectiveness, and units effectiveness. Range is the number of allowance candidate items selected for stockage. The dollar value is the total cost of the allowances determined for the selected items. Range effectiveness is the number of items demanded and selected for stockage divided by the total number of items demanded. Requisition effectiveness is the number of requisitions satisfied divided by the number of requisitions placed. Units effectiveness is the number of units satisfied divided by the number of units demanded. All three effectiveness measures were computed quarterly reflecting the fact that a COSAL is built under a 90 day sustainability scenario. In measuring requisition effectiveness a full allowance quantity was assumed to be available at the beginning of each quarter for comparison with the usage data for the quarter. In addition to the quarterly effectiveness figures, an overall value was computed for each effectiveness measure. This value measures the support of each model over the entire 10 quarter period considered in this evaluation. Both

gross and model effectiveness were computed for each effectiveness measure. In computing gross effectiveness, demands for all items were considered. Model effectiveness, on the other hand, considered only demands for candidate items. Finally, separate effectiveness measurements were made for Navy managed consumable, Navy managed repairable, and DLA (Defense Logistics Agency) managed categories of material and for each essentiality category.

The impact on CASREPs was measured by comparing the items requested on the CASREP requisitions with the range of items allowed by each model. Counts of the number of requisitions for which the requested item was stocked and the number of requisitions for which the requested item was not stocked were obtained, by severity, for each model. These counts were tallied for each of the four test ships and for the entire class for each of the problem systems. For purposes of impact statements, only allowance candidate items were considered in this process. However, counts of the number of requisitions for which the requested item was not an allowance candidate were obtained. The CASREPs for these noncandidate items for the four test ships were provided to NAVSSESDETMECH for analysis.

III. FINDINGS

A. ESSENTIALITY CODING. The results of the EIC level essentiality assignments for each of the four classes of ships considered in this study are shown in TABLE I. The counts shown represent results from the essentiality coding program and the subsequent review by NAVSSESDETMECH for consolidation of multiple EICs to one EIC, where appropriate. The column headed # EICs represents the number of EICs which experienced at least one CASREP during the period of time used in the essentiality coding process. The average number of EICs coded primary, relative to the total EICs that experienced a CASREP, was about 33%.

TABLE I

EIC Level Essentialities by Ship

Class	# Hulls	# EICs with CASREP	# EICs (%) Coded	
			Primary	Secondary
CG 16	9	435	161 (37%)	274 (63%)
CG 26	9	498	163 (33%)	335 (67%)
DD 963	30	322	70 (22%)	252 (78%)
DDG 2	23	786	271 (34%)	515 (66%)

The essentiality assignments resulting from application of the ship class level essentiality codes to each of the corresponding test ships are shown in TABLE II. At the ship level the average number of EICs coded primary across the four ships was 11% as opposed to the 33% figure at the class level. This difference was due to the fact that the TABLE I numbers do not include the EICs with no historical CASREPs. A large number of the test ship EICs did not experience any CASREPs and, consequently, were coded secondary. For example, of the 831 EICs for the CG 22, 89 were coded primary and 742 were coded secondary. Since there were only 274 EICs coded secondary (each of which had at least one CASREP) for the entire class, at least 468 (742-274) of the EICs for the CG 22 did not have any historical CASREPs. Based on application of the ship level EIC essentiality assignments to the applicable APLs, the average number of APLs coded primary across the four ships was 26%. Finally, application of the APL essentiality codes to the applicable items resulted in an average across the four ships of 38% of the items being coded primary.

TABLE II

Essentiality Assignments by Ship

Ship	# EICs (%) Coded		# APLs (%) Coded		# Items (%) Coded	
	Primary	Secondary	Primary	Secondary	Primary	Secondary
CG 22	89 (11%)	742 (89%)	1,232 (24%)	3,863 (76%)	19,246 (33%)	38,303 (67%)
CG 30	81 (10%)	716 (90%)	1,537 (27%)	4,060 (73%)	28,958 (43%)	38,437 (57%)
DD 963	41 (7%)	539 (93%)	622 (16%)	3,370 (84%)	14,827 (27%)	39,141 (73%)
DDG 23	116 (18%)	541 (82%)	1,538 (37%)	2,602 (63%)	23,136 (46%)	27,243 (54%)

B. RANGE/DOLLAR VALUE/EFFECTIVENESS IMPACT. The impact of modified FLSIP on range, dollar value, and overall range and requisition effectiveness is shown in TABLE III. Range and dollar value figures are provided by SRI (Storeroom Item) and OSI (Operating Space Item) categories. The OSI figures are provided for information as the allowances for these items are predetermined quantities not computed by the model. The modified FLSIP resulted in an average SRI range increase of 22% across the four ships. SRI investment increased by an average 39% across the four ships. Gross range effectiveness increased from three to five percentage points while model range effectiveness increased from five to nine percentage points. Requisition effectiveness increased from two to five percentage points gross and four to six percentage points model. Although units effectiveness was computed in this study, it is not included in the impact discussion because the figures were extremely low (20% to 38% gross for modified FLSIP) and there was little or no impact. The unit effectiveness figures were distorted by a number of demand records with very large quantities.

It is noted that the increase in SRI investment was higher for the CG 30 than any other ship including the CG 22. The difference in the impact on SRI investment between the two CGs is attributable to the major difference in armament of the two ships. Whereas the CG 30 has a single twin TERRIER/ASROC missile system, the CG 22 has two. This difference accounts for the higher FLSIP SRI investment for the CG 22. Because of the increased population, more items qualified for the CG 22 FLSIP COSAL than for the CG 30 FLSIP COSAL. Under modified FLSIP, the two CGs receive more comparable SRI levels.

TABLE III

Range/Dollar/Value/Effectiveness Impact (All Items)

						Effectiveness (Over 10 Qtrs)			
		Range		$ Value		Range		Requisition	
Ship	Model*	SRI	OSI	SRI	OSI	Gross	Model	Gross	Model
CG 22	F	13,873	4,391	2,682K	3,440K	44%	78%	47%	73%
	M	16,663	4,391	3,490K	3,440K	47%	84%	49%	77%
CG 30	F	14,561	4,290	1,948K	1,430K	49%	72%	54%	70%
	M	18,249	4,290	3,162K	1,430K	53%	79%	57%	75%
DD 963	F	13,339	4,718	2,833K	3,359K	51%	71%	55%	70%
	M	15,347	4,718	3,575K	3,359K	54%	76%	58%	74%
DDG 23	F	11,603	3,858	1,237K	2,517K	50%	71%	52%	69%
	M	14,925	3,858	1,829K	2,157K	55%	80%	57%	75%

*F = FLSIP, M = Modified FLSIP

Tables showing the impact of modified FLSIP on range, dollar value, and overall range and requisition effectiveness for Navy managed consumable, Navy managed repairable, and DLA managed categories of material are provided in Appendix B.

The impact of modified FLSIP on overall model range and requisition effectiveness relative to the effectiveness for items vital to primary coded APLs (P/V ITEMS) and items vital to secondary coded APLs (S/V ITEMS) is shown in TABLE IV. Gross effectiveness was not computed by primary and secondary

categories due to the lack of essentiality codes for noncandidate item usage data. The effectiveness figures for nonvital items are not shown because there was, by design, no impact on these items. Furthermore, these items represent less than five percent of the allowance candidate items of each of the test ships. For items vital to primary coded APLs, overall model range effectiveness increased from 11 to 15 percentage points and reached a level of approximately 90%. Requisition effectiveness increased from six to 11 percentage points and reached a level of approximately 82%. The slight differences in range and requisition effectiveness for items vital to secondary coded APLs are attributable to certain APLs which were coded nonvital under FLSIP. Items applicable to these APLs were stocked by FLSIP only if they were demand-based or had override requirements. Under modified FLSIP these APLs were coded secondary, and items applicable to them were stocked as insurance if they met the current (one hit in four years) insurance criteria.

TABLE IV

Effectiveness Impact (All, P/V and S/V Items)

		Model Effectiveness					
		Range			Requisition		
Ship	Model*	All Items	P/V Items	S/V Items	All Items	P/V Items	S/V Items
CG 22	F	78%	82%	70%	73%	76%	66%
	M	84%	93%	70%	77%	82%	66%
CG 30	F	72%	77%	63%	70%	74%	63%
	M	79%	90%	64%	75%	82%	64%
DD 963	F	71%	76%	66%	70%	76%	65%
	M	76%	89%	66%	74%	85%	66%
DDG 23	F	71%	74%	61%	69%	71%	60%
	M	80%	89%	62%	75%	82%	60%

*F = FLSIP, M = Modified FLSIP

The differences between gross and model effectiveness shown in TABLE III reflect a substantial incidence of usage data for items not included in the ships' allowance candidate files. The ships' allowance candidate files were based on an extract from the Weapons Systems File of all items installed on the applicable ship and within the ship's maintenance capability to remove and replace. TABLE V shows the total demands during the evaluation period and the demands for noncandidate items. The proportion of noncandidate demands averaged 26% across the four ships. The highest percentage, 36%, was observed for the CG 22. Further investigation revealed that the CG 22 candidate file reflected a post-overhaul configuration while the demand data was generated by the pre-overhaul configuration. This problem occurred only on the CG 22.

TABLE V

Incidence of Noncandidate Item Usage
January 1978 - June 1980

Ship	Total # Usage Data Records	# Records for Noncandidate Items	Proportion of Records for Noncandidate Items
CG 22	9,974	3,563	36%
CG 30	11,915	2,795	23%
DD 963	9,075	1,988	22%
DDG 23	8,921	2,126	24%

It should be noted that some of the noncandidate item usage data may have been for items which were substitutes or interchangeables for items already on the ships' candidate files or for GUCL (General Use Consumable List) type items which are excluded from the ships' candidate files by policy. Some other possibilities are items which were beyond the maintenance capability

of the ship or items which had zero overrides. Hence, the figures shown in TABLE V present a worst case situation. However, a large segment of the noncandidate item usage data is due to configuration file deficiencies. Given these deficiencies, the expected performance of modified FLSIP lies somewhere between the gross and model effectiveness figures shown in TABLE III. The ILO (Integrated Logistics Overhaul) program is a current Navy initiative aimed at resolving configuration problems by improving the effectiveness of the SOAP (Supply Operations Assistance Program) process. The extent to which such efforts are successful will be the determining factor in closing the gap between gross and model effectiveness.

A profile of the noncandidate item usage data by EIC essentiality, cognizance symbol and FSC (Federal Supply Class) categories is provided in Appendix C for information.

Another way of looking at the performance of shipboard allowances is the timeliness of supply support. To this end the Navy uses a measurement known as mean supply response time or MSRT. The MSRT is a weighted average of the time it takes to get material if available aboard ship and the time it takes if it is not available aboard ship. The weighting factor is the percentage of time that material is available aboard ship which is measured by gross requisition effectiveness. The draft OPNAVINST 4441.12B specifies a two hour timeframe for obtaining material available aboard ship. Based on recent studies within CNO, the time it takes to get material not available aboard the ship was estimated to be 420 hours. Using these timeframes and the gross requisition effectiveness figures obtained in this study, MSRTs were computed for FLSIP and modified FLSIP for each of the four test ships. In addition, MSRTs were computed for a hypothetical "perfect" candidate file in which there

were no deficiencies. In these computations model effectiveness was used in lieu of gross effectiveness under the assumption that they would be equivalent for a "perfect" candidate file. The results of these MSRT computations are shown in TABLE VI. Based on the gross effectiveness figures obtained in this study, modified FLSIP produced a seven percent (about 14 hours) improvement in MSRT across the four ships but still did not achieve the 120 hour goal established in the draft OPNAVINST 4441.12B. Under the "perfect" candidate file assumption, modified FLSIP surpassed the 120 hour support goal.

TABLE VI

Mean Supply Response Time Impact

	Mean Supply Response Time (Hours)			
	Current Candidate File		"Perfect" Candidate File	
Ship	FLSIP	Mod. FLSIP	FLSIP	Mod. FLSIP
CG 22	223	214	114	99
CG 30	195	180	126	107
DD 963	191	178	126	111
DDG 23	201	182	132	107

C. CASREP IMPACT. The impact of modified FLSIP on CASREP requisitions for each of the four test ships is shown in TABLE VII. The table shows the number and percent of CASREP requisitions for which the requested item was stocked by FLSIP and by modified FLSIP. It should be noted that only candidate items were considered in developing these figures. In the important C3/C4 category modified FLSIP achieved an average 15% improvement across the four ships in

the number of CASREP requisitions for which the requested item was stocked. The improvement in the C2 area averaged about eight percent across the four ships. The overall improvement was about nine percent across the four ships.

TABLE VII

CASREP Impact by Ship

		# CASREP Reqns for Stocked Items (% Based on Candidate Items Only)		
Ship	Model*	C2	C3/C4	Total
CG 22	F	123(72%)	13(54%)	136(69%)
	M	135(79%)	18(75%)	153(78%)
CG 30	F	289(64%)	82(54%)	371(61%)
	M	319(71%)	106(69%)	425(70%)
DD 963	F	105(61%)	22(71%)	127(62%)
	M	128(74%)	23(74%)	151(74%)
DDG 23	F	70(46%)	8(47%)	78(46%)
	M	81(53%)	11(65%)	92(55%)

*F = FLSIP, M = Modified FLSIP

As was the case with the 3M usage data, a significant number of the CASREP requisitions were for items not included in the ships' allowance candidate files. The scope of this problem is shown in TABLE VIII for each of the test ships. The average proportion across the four ships considering all CASREPs was 43%. It should be noted that some of these noncandidate item data were for part numbered items which might cross to a stock number on the ships' candidate files. In order to quantify the real candidate file deficiencies, the CASREP requisitions for the noncandidate items were provided to NAVSSESDETMECH for review. The results of this review, as provided in Appendix D, indicate that at least 30% of the noncandidate item requisitions do not reflect candidate file deficiencies.

TABLE VIII

Incidence of Noncandidate Item CASREPs by Ship

	# CASREP Reqns For All Items			# CASREP Reqns For Noncandidate Items			Proportion of Reqns For Noncandidate Items		
Ship	C2	C3/C4	Total	C2	C3/C4	Total	C2	C3/C4	Total
CG 22	348	36	384	176	12	188	51%	33%	49%
CG 30	646	198	844	192	45	237	30%	23%	28%
DD 963	346	61	407	173	30	203	50%	49%	50%
DDG 23	363	50	413	212	33	245	58%	66%	59%

Special problem systems on the test ships were analyzed separately. Since the volume of data for the problem system on a single ship was very small, CASREPs were extracted for the problem system across all ships within the applicable class. Since the same system was installed on each of the ships, it was assumed that any of the class CASREPs could have occurred on the test ship. The impact of modified FLSIP on CASREP requisitions for each of the problem systems considered in this study is shown in TABLE IX. The table shows the number and percent of CASREP requisitions for which the requested item was stocked by FLSIP and by modified FLSIP. Only CASREP requisitions for items applicable to the problem systems and included in the test ships' allowance candidate files were considered in developing these figures. However, all such CASREP requisitions from the entire test ship's class were used. In the C3/C4 category, modified FLSIP achieved an average 13% increase across all systems/classes in the number of CASREP requisitions for which the requested item was stocked. An average increase of 12% across the systems/classes was realized in the C2 area. The overall increase was about 13% across the systems/classes.

TABLE IX

CASREP Impact by Problem System Within Ship Class

Ship Class	Problem System	Model*	# CASREP Reqns for Stocked Items (Candidate Items Only) C2	C3/C4	Total
CG 16	AN/SPS-48	F	91(50%)	30(45%)	121(49%)
		M	108(59%)	38(58%)	146(59%)
	AN/SPG-55B	F	474(78%)	290(84%)	764(80%)
		M	556(91%)	322(94%)	878(92%)
CG 26	AN/SPS-48	F	72(59%)	32(53%)	104(57%)
		M	95(77%)	48(80%)	143(78%)
	AN/SPG-55B	F	145(70%)	79(68%)	224(69%)
		M	167(81%)	97(84%)	264(82%)
DD 963	AN/SPS-40	F	34(30%)	52(39%)	86(35%)
		M	56(50%)	66(49%)	122(49%)
	Mark 86	F	585(72%)	323(71%)	908(71%)
		M	673(83%)	387(84%)	1,060(83%)
DDG 2	AN/SPS-40	F	25(40%)	9(27%)	34(36%)
		M	34(55%)	14(42%)	48(51%)

*F = FLSIP, M = Modified FLSIP

The incidence of CASREP requisitions for items not identified to the test ships' allowance candidate files is shown in TABLE X for the problem systems/ship classes considered. The average proportion of requisitions for noncandidate items was 21% for all CASREPs.

TABLE X

Incidence of Noncandidate Item CASREPs
(Problem Systems Within Ship Class)

Ship Class	Problem System	# CASREP Reqns For All Items			# CASREP Reqns For Noncandidate Items			Proportion of Reqns For Noncandidate Items		
		C2	C3/C4	Total	C2	C3/C4	Total	C2	C3/C4	Total
CG 16	AN/SPS-48	212	72	284	29	6	35	14%	8%	12%
	AN/SPG-55B	722	400	1,122	114	56	170	16%	14%	15%
CG 26	AN/SPS-48	142	76	218	19	16	35	13%	21%	16%
	AN/SPG-55B	291	137	428	84	21	105	29%	15%	25%
DD 963	AN/SPS-40	151	206	357	38	72	110	25%	35%	31%
	Mark 86	1,050	625	1,675	238	167	405	23%	27%	24
DDG 2	AN/SPS-40	92	47	139	30	14	44	33%	30%	32%

IV. CONCLUSIONS

This study has evaluated the impact on peacetime Fleet support of the CNA recommended changes to the FLSIP COSAL Model. With respect to the CHNAVMAT approved essentiality coding process, it appears that about one-ninth of the equipments (EICs) will be coded essential to a primary mission, and about two-fifths of the ships' allowance candidate items will be coded essential to a primary mission.

A summary of the impact of modified FLSIP on SRI range and dollar value, overall range and requisition effectiveness, CASREP requisitions for stocked items, and mean supply response time is shown in TABLE XI. Increases in SRI range varied from 15 to 29 percent across the four ships. SRI investment increased from 26 to 62 percent across the four ships. However, significant

improvements in model effectiveness and the proportion of CASREP requisitions for stocked items were realized by these increases. Particularly noteworthy were the improvements in both range and requisition effectiveness for items vital to primary mission essential equipments. Range effectiveness increased from 11 to 15 percentage points across the four ships for these items. Requisition effectiveness for these items increased from six to 11 percentage points across the four ships. The proportion of CASREP requisitions for which the requested item was stocked improved by nine to 12 percentage points across the four ships for all CASREPs and by three to 21 percentage points for C3/C4 CASREPs.

The impact on gross effectiveness was not as large. Gross range effectiveness increased by three to five percentage points across the four ships while gross requisition effectiveness increased by two to five percentage points. Mean supply response time decreased from four to nine percent (9-19 hours) across the four ships, but remained above 170 hours.

TABLE XI

Summary of Modified FLSIP Impact

Ship	Model*	SRI Range	SRI $ Value	Model Effectiveness (over 10 Qtrs)				Proportion of CASREP Reqns For Stocked Items (Candidate Items Only)			Gross Effectiveness (over 10 Qtrs)		Mean Supply Response Time (Hours)
				Range		Requisition							
				All Items	P/V Items	All Items	P/V Items	C2	C3/C4	Total	Range	Requisition	
CG 22	F	13,873	2,682K	78%	82%	73%	76%	72%	54%	69%	44%	47%	223
	M	+20%	+30%	+6%	+11%	+4%	+6%	+7%	+21%	+9%	+3%	+2%	-4%
CG 30	F	14,561	1,948K	72%	77%	70%	74%	64%	54%	61%	49%	54%	195
	M	+25%	+62%	+7%	+13%	+5%	+8%	+7%	+15%	+9%	+4%	+3%	-8%
DD 963	F	13,339	2,833K	71%	76%	70%	76%	61%	71%	62%	51%	55%	191
	M	+15%	+26%	+5%	+13%	+4%	+9%	+13%	+3%	+12%	+3%	+3%	-7%
DDG 23	F	11,603	1,237K	71%	74%	69%	71%	46%	47%	46%	50%	52%	201
	M	+29%	+48%	+9%	+15%	+6%	+11%	+7%	+18%	+9%	+5%	+5%	-9%

*F = FLSIP, M = Modified FLSIP

The differences between gross and model effectiveness reflect the deficiencies which exist in the test ships' allowance candidate files. Although the gross effectiveness figures shown in this study represent worst case situations - no consideration was given to whether these items were acceptable substitutes for items that were in the candidate file, were GUCL type material, had zero overrides, or were beyond the maintenance capability of the ship - there still exists a significant problem in this area. The extent to which configuration data problems are resolved will determine the actual level of support modified FLSIP will provide to the Fleet. Given the resolution of these problems, the potential exists for achieving a level of support approaching the model effectiveness figures shown in this study and for satisfying the proposed CNO mean supply response time goal of 120 hours.

APPENDIX A: REFERENCES

1. CNO ltr Ser 96/193079 of 24 Jul 1979

2. Third Advisory Committee Meeting of the Shipboard Parts Allowance Policy Study of 2 Jul 1980

3. Fourth Advisory Committee Meeting of the Shipboard Parts Allowance Policy Study of 11 Jul 1980

4. CNO ltr Ser 412E/733166 of 14 Aug 1980

5. COMNAVSUPSYSCOM ltr 04A6/LJB of 15 Sep 1980

6. FLEMATSUPPO ltr 9321-E60/RJG/268 5250 of 15 Dec 1980

7. CHNAVMAT ltr 043B/FCA of 16 Mar 1981

APPENDIX B: RANGE/DOLLAR VALUE/EFFECTIVENESS IMPACT FOR NAVY MANAGED CONSUMABLE, NAVY MANAGED REPAIRABLE, AND DLA MANAGED ITEMS

The impact of modified FLSIP (Fleet Logistics Support Improvement Program) on range, dollar value, and overall range and requisition effectiveness for Navy managed consumable items, Navy managed repairable items, and DLA (Defense Logistics Agency) managed items are shown in TABLEs I, II, and III, respectively. Range and dollar value figures are provided by SRI (Storeroom Items) and OSI (Operating Space Items) categories. The OSI figures are provided for information as the allowances for these items are predetermined quantities not computed by the model. Both gross and model effectiveness are shown.

TABLE I

Range/Dollar Value/Effectiveness Impact
(Navy Managed Consumable Items)

Ship	Model*	Range		$ Value		Effectiveness (over 10 Qtrs)			
						Range		Requisition	
		SRI	OSI	SRI	OSI	Gross	Model	Gross	Model
CG 22	F	1,526	1,001	442K	2,003K	33%	68%	35%	69%
	M	1,972	1,001	589K	2,003K	38%	77%	38%	75%
CG 30	F	1,614	961	298K	432K	38%	59%	42%	60%
	M	2,217	961	602K	432K	46%	71%	48%	69%
DD 963	F	1,453	1,182	327K	1,249K	36%	52%	41%	56%
	M	1,830	1,182	465K	1,249K	45%	65%	49%	66%
DDG 23	F	1,421	870	257K	1,119K	36%	56%	38%	55%
	M	1,973	870	407K	1,119K	44%	69%	44%	65%

*F = FLSIP, M = Modified FLSIP

TABLE II

Range/Dollar Value/Effectiveness Impact
(Navy Managed Repairable Items)

Ship	Model*	Range		$ Value		Effectiveness (over 10 Qtrs)			
						Range		Requisition	
		SRI	OSI	SRI	OSI	Gross	Model	Gross	Model
CG 22	F	650	306	1,887K	1,090K	37%	76%	38%	77%
	M	895	306	2,428K	1,090K	40%	82%	40%	81%
CG 30	F	575	273	1,353K	626K	48%	66%	56%	68%
	M	905	273	2,143K	626K	59%	82%	64%	77%
DD 963	F	714	332	2,123K	1,789K	55%	69%	56%	70%
	M	931	332	2,620K	1,789K	61%	75%	60%	75%
DDG 23	F	341	310	750K	1,115K	44%	66%	49%	68%
	M	531	310	1,113K	1,115K	50%	75%	55%	76%

*F = FLSIP, M = Modified FLSIP

TABLE III

Range/Dollar Value/Effectiveness Impact
(DLA Managed Items)

Ship	Model*	Range		$ Value		Effectiveness (over 10 Qtrs)			
						Range		Requisition	
		SRI	OSI	SRI	OSI	Gross	Model	Gross	Model
CG 22	F	11,697	3,084	352K	348K	46%	79%	49%	73%
	M	13,796	3,084	473K	348K	49%	84%	51%	77%
CG 30	F	12,372	3,056	297K	373K	50%	75%	55%	72%
	M	15,127	3,056	417K	373K	54%	80%	58%	75%
DD 963	F	11,172	3,204	383K	322K	52%	74%	57%	7[illegible]%
	M	12,586	3,204	489K	322K	55%	77%	59%	75%
DDG 23	F	9,841	2,678	229K	284K	53%	74%	55%	71%
	M	12,421	2,678	309K	284K	58%	82%	59%	76%

*F = FLSIP, M = Modified FLSIP

APPENDIX C: NONCANDIDATE ITEM USAGE DATA PROFILE

This appendix provides a profile by (1) the essentiality of the reported EIC (Equipment Identification Code), (2) the cognizance symbol, and (3) the FSC (Federal Supply Class) of those usage data records for which the required items were not included in the ships' allowance candidate files. All records for each test ship are included in the EIC essentiality profile. For the cognizance symbol and FSC profiles, only those categories which accounted for at least one percent of the records for the ship are included.

EIC Essentiality

Ship	EIC Essentiality	# Records for EIC Essentiality	Proportion of Ship's Records
CG 22	Primary	1,005	28.2%
	Secondary	1,727	48.5%
	Secondary (No CASREPs)[1]	831	23.3%
CG 30	Primary	600	21.5%
	Secondary	928	33.2%
	Secondary (No CASREPs)	1,267	45.3%
DD 963	Primary	303	15.2%
	Secondary	865	43.5%
	Secondary (No CASREPs)	820	41.3%
DDG 23	Primary	683	32.1%
	Secondary	710	33.4%
	Secondary (No CASREPs)	733	34.5%

[1]These records are for EICs with no CASREP (Casualty Reporting System) history across the ship class during the time period used for essentiality coding.

Cognizance Symbol

Ship	Cognizance Symbol	# Records for Cognizance Sumbol	Proportion of Ships' Records
CG 22	9Z	905	25.4%
	9C	732	20.5%
	9N	582	16.3%
	9G	470	13.2%
	1H	325	9.1%
	9Q	260	7.3%
	4G	117	3.3%
	4N	54	1.5%
CG 30	9Z	770	27.5%
	9N	501	17.9%
	1H	365	13.1%
	9C	360	12.9%
	9G	322	11.5%
	9Q	192	6.9%
	2H	48	1.7%
	9D	47	1.7%
	4G	46	1.6%
	4N	46	1.6%
DD 963	9N	470	23.6%
	9Z	391	19.7%
	9C	246	12.4%
	9G	235	11.8%
	1H	211	10.6%
	4G	104	5.2%
	9Q	99	5.0%
	2H	29	1.5%
	4N	22	1.1%
	1R	21	1.1%
	9V	21	1.1%
DDG 23	9Z	422	19.8%
	1H	387	18.2%
	9C	344	16.2%
	9G	315	14.8%
	9N	302	14.2%
	9Q	74	3.5%
	4N	61	2.9%
	2H	47	2.2%
	4G	33	1.6%

FSC

Ship	FSC	Description	# Records for FSC	Proportion of Ships' Records
CG 22	4730	Fittings & Specialties: Hose, Pipe & Tube	389	10.9%
	5330	Packing & Gasket Materials	205	5.8%
	4820	Valves, Nonpowered	185	5.2%
	5960	Electron Tubes, Transistors & Rectifying Crystals	136	3.8%
	5310	Nuts & Washers	132	3.7%
	5305	Screws	119	3.3%
	5820	Radio & Television Communication Equipment, Except Airborne	110	3.1%
	5307	Studs	98	2.8%
	6685	Pressure, Temperature & Humidity Measuring & Controlling Instruments	91	2.6%
	5905	Resistors	72	2.0%
	5935	Connectors, Electrical	70	2.0%
	4130	Refrigeration & Air Conditioning Plants & Components	56	1.6%
	5945	Relays, Contractors & Solenoids	53	1.5%
	6240	Electric Lamps	53	1.5%
	6145	Wire & Cable, Electrical	52	1.5%
	5120	Hand Tools, Nonedged, Nonpowered	50	1.4%
	5306	Bolts	50	1.4%
	5340	Miscellaneous Hardware	50	1.4%
	5930	Switches	50	1.4%
	5961	Semiconductor Devices	46	1.3%
	4710	Pipe & Tube	42	1.2%
	5950	Coils & Transformers	42	1.2%
	5315	Nails, Keys & Pins	39	1.1%
	6625	Electrical & Electronic Properties Measuring & Testing Instruments	38	1.1%
	5940	Lugs, Terminals & Terminal Strips	37	1.0%

Ship	FSC	Description	# Records for FSC	Proportion of Ships' Records
CG 30	5305	Screws	130	4.7%
	5330	Packing & Gasket Materials	119	4.3%
	5310	Nuts & Washers	114	4.1%
	4730	Fittings & Specialties: Hose, Pipe & Tube	107	3.8%
	4820	Valves, Nonpowered	97	3.5%
	5905	Resistors	92	3.3%
	6625	Electrical & Electronic Properties Measuring & Testing Instruments	64	2.3%
	5935	Connectors, Electrical	62	2.2%
	6145	Wire & Cable, Electrical	58	2.1%
	4710	Pipe & Tube	56	2.0%
	5960	Electron Tubes, Transistors & Rectifying Crystals	55	2.0%
	5120	Hand Tools, Nonedged, Nonpowered	51	1.8%
	5920	Fuses & Lightning Arresters	51	1.8%
	6685	Pressure, Temperature & Humidity Measuring & Controlling Instruments	49	1.8%
	5930	Switches	48	1.7%
	5961	Semiconductor Devices	43	1.5%
	6240	Electric Lamps	42	1.5%
	9510	Bars & Rods, Iron & Steel	42	1.5%
	3110	Bearings, Antifriction, Unmounted	41	1.5%
	6650	Optical Instruments	41	1.5%
	5910	Capacitors	39	1.4%
	5845	Underwater Sound Equipment	34	1.2%
	5820	Radio & Television Communication Equipment, Except Airborne	32	1.1%
	9530	Bars & Rods, Nonferrous Base Metal	32	1.1%
	5945	Relays, Contractors & Solenoids	31	1.1%
	5306	Bolts	29	1.0%

Ship	FSC	Description	# Records for FSC	Proportion of Ships' Records
DD 963	5330	Packing & Gasket Materials	200	10.1%
	5820	Radio & Television Communication Equipment, Except Airborne	99	5.0%
	5920	Fuses & Lightning Arresters	86	4.3%
	4820	Valves, Nonpowered	77	3.9%
	5961	Semiconductor Devices	76	3.8%
	4730	Fittings & Specialties: Hose, Pipe & Tube	73	3.7%
	5930	Switches	56	2.8%
	5960	Electron Tubes, Transistors & Rectifying Crystals	55	2.8%
	3110	Bearings, Antifriction, Unmounted	53	2.7%
	5935	Connectors, Electrical	45	2.3%
	6625	Electrical & Electronic Properties Measuring & Testing Instruments	45	2.3%
	6210	Indoor & Outdoor Electric Lighting Fixtures	38	1.9%
	5905	Resistors	29	1.5%
	6810	Chemicals	29	1.5%
	2835	Gas Turbines & Jet Engines, Except Aircraft; & Components	26	1.3%
	6240	Electric Lamps	26	1.3%
	9150	Oils & Greases: Cutting, Lubricating & Hydraulic	25	1.3%
	5945	Relays, Contractors & Solenoids	24	1.2%
	5305	Screws	22	1.1%
	4320	Power & Hand Pumps	20	1.0%
	5310	Nuts & Washers	20	1.0%

Ship	FSC	Description	# Records for FSC	Proportion of Ships' Records
DDG 23	4820	Valves, Nonpowered	166	7.8%
	6650	Optical Instruments	92	4.3%
	5330	Packing & Gasket Materials	88	4.1%
	5305	Screws	85	4.0%
	4730	Fittings & Specialties: Hose, Pipe & Tube	81	3.8%
	6685	Pressure, Temperature & Humidity Measuring & Controlling Instruments	73	3.4%
	5960	Electron Tubes, Transistors & Rectifying Crystals	71	3.3%
	6830	Gases: Compressed & Liquefied	42	2.0%
	5310	Nuts & Washers	39	1.8%
	3110	Bearings, Antifriction, Unmounted	38	1.8%
	4710	Pipe & Tube	38	1.8%
	5820	Radio & Television Communication Equipment, Except Airborne	36	1.7%
	5920	Fuses & Lightning Arresters	35	1.6%
	6240	Electric Lamps	34	1.6%
	5307	Studs	33	1.6%
	5961	Semiconductor Devices	31	1.5%
	5905	Resistors	27	1.3%
	6145	Wire & Cable, Electrical	27	1.3%
	1285	Fire Control Radar Equipment, Except Airborne	25	1.2%
	5945	Relays, Contractors & Solenoids	24	1.1%
	4320	Power & Hand Pumps	23	1.1%
	5315	Nails, Keys & Pins	23	1.1%
	1440	Launchers, Guided Missile	22	1.0%
	2040	Marine Hardware & Hull Items	22	1.0%

APPENDIX D: RESULTS OF NAVSSESDETMECH ANALYSIS OF NONCANDIDATE ITEM CASREPS

In an effort to identify candidate file deficiencies in the CASREP (Casualty Reporting System) requisition data, the actual CASREP requisition records for items not included in the test ships' allowance candidate files were provided to NAVSSESDETMECH (Naval Ship Systems Engineering Station Detachment Mechanicsburg) for manual review. The results of this review of 879 requisitions are described below.

- 42 CASREP requisitions (all for the DD 963) were identified by pseudo EIC (Equipment Identification Code) "ZHBH" as COMNAVAIRSYSCOM (Naval Air Systems Command) equipments which, by design, would not be COSAL (Coordinated Shipboard Allowance List) candidates.
- 343 CASREP requisitions were identified to APLs (Allowance Parts Lists) not presently on the ship. Of these requisitions, 99 (mostly for the CG 22) were identified to APLs which were previously on the ship. (As noted earlier, the CG 22 allowance files represented a post-overhaul configuration while the CASREP data resulted from the pre-overhaul configuration.) For 42 of these 99 requisitions identified to APLs previously on the ship, the requested part was on the applicable APL. A sample of the remaining 244 (343-99) requisitions for APLs not on the ships revealed 25 for which the requested part was on the cited APL and 21 for which the part was not on the APL.
- 210 CASREP requisitions were identified to APLs on the ship, but the requested part was not on the APL. A small sample of these revealed that four out of 12 were substitutes for items already on the COSAL, an indication that the COSAL is not being used as intended to identify the stock number for the desired repair part.

- 73 requisitions were for items coded as zero overrides (this precludes the item from consideration for allowance) or for items coded as beyond the maintenance capability of the ship.
- 159 of the CASREP requisitions were identified by part number. Of these, 24 were identified to stock numbered items, and 20 of the 24 were on the cited APL on the ship.
- 14 requisitions were for parts identified by permanent NICNs (Navy Item Control Numbers) which, by design, are not included in the candidate file.
- 8 requisitions were reported at the ACL (Allowance Components List) level. An ACL identifies a major equipment and lists the APLs which comprise the equipment.
- 30 requisitions were for parts listed on an APL presently on the ship. These items should have appeared on the candidate file. Reasons for noninclusion were not researched.

In summary, the NAVSSESDETMECH review identified the following categories of parts which were not considered candidate file deficiencies.

Category	# of CASREP Reqns
Not COSAL Equipment	42
Part on APL Previously on Ship	42
Part on APL Not Presently and No Evidence of Being Previously on Ship*	25**
Part Substitute for Item on COSAL	4***
Zero Override or Beyond Maintenance Capability of Ship	73
Part Number Identified to Stock Number on APL on Ship	20
Permanent NICNs	14
ACL Reported	8
Part on APL Presently on Ship	30

* APL may have been deleted before such actions were recorded on Weapons Systems File or this category could represent incomplete ship configuration.
** Based on sample of 46 out of 244
*** Based on sample of 12 out of 210

Since some sampling was used in this review, an exact count of the number of candidate file deficiencies could not be obtained. Based on the figures shown above, at least 258 of the requisitions were for parts that were not considered deficiencies. Since there were 879 requisitions reviewed, it can be said that not more than 70% were for parts that could be considered candidate file deficiencies.

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13 ABSTRACT

This study evaluates the recommended changes to current shipboard allowance policy resulting from a recent CNA (Center for Naval Analyses) study. The objective is to determine the impact of these changes on peacetime Fleet support. Historical CASREP (Casualty Reporting System) data were used to identify equipments essential to primary missions. The current COSAL (Coordinated Shipboard Allowance List) Model was modified to stock a greater range of items supporting these equipments. The impact was then measured in terms of range of items stocked, investment, effectiveness, and reductions in CASREP requisitions.

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